

The AltU Cosmology Model.

Summary by: Ian Miller. March 13, 2019.

The AltU model ([link](#)) is based on a modified version of the equations of special relativity, one where gravitational fields not only slow time, they also reduce the local speed of light by the same factor. Spatial distances are unaffected: AltU is spatially stable. The resulting variable speed of light, and of time, is referred to in AltU as the “speed limit”.

The AltU model has three adjustable parameters: its metric equation, the current value of the Hubble coefficient, and the large-scale mass density of the universe. The metric equation is:

$$d\tau^2 = e^{\frac{2\varphi}{c^2}} dt_c^2 - e^{\frac{-2\varphi}{c^2}} \frac{dx_s^2}{c_c^2}$$

Here c_c is the mean speed limit in the universe (a value that decreases over time), t_c is cosmic time, φ is the gravitational potential due to nearby mass concentrations, and dx_s is a differential spatial distance in the observer’s frame.

The resulting geodesic equation passes all of the basic tests for gravitational theories. Over long durations it predicts a universal reduction of inertial velocities at the Hubble rate. The effect is that photons always travel at the current local speed limit, and orbital systems maintain stable diameters, but orbital periods increase at the Hubble rate.

The gravitational intensity everywhere slowly increases because the gravitational fields of masses expand at the speed of light, and that increasing gravitational intensity causes the reductions to the speed limit mentioned above. Nearby masses add a very small increment to the intensity, via φ , which results in their gravitational effects.

Cosmological predictions in AltU are based on a differential equation that describes the evolution of the speed limit over time, and there is no simple analytical formula for the result. The result is a universe that is about 14.99 Ga old, Hubble diagrams that match observations (including “cosmic acceleration”), and angular diameter predictions that reflect the stable spatial geometry. No dark energy is required.

Results: Speed limit $c_c = c_{c0}(1 + z)$. Cosmic time: $t_c \cong 14.99 \text{ Ga} (1 + z)^{-0.9733}$.
Distance $d \cong \frac{c}{H_0} (1.0012 \ln(1 + z) + 0.0115 \ln^2(1 + z) + 0.00055 \ln^3(1 + z))$.

Definitions: Ang. dist. $d_A \equiv d$; lum. dist. $d_L \equiv d(1 + z)$; time dilation factor $\gamma \equiv 1 + z$; dist. modulus $\mu \equiv 5 \log_{10}(d_L/1\text{pc}) - 5$.

The following chart gives an indication of the results- please see the paper for additional and more detailed results:

